passing through the Strait of Florida, and the whole generally called the Gulf Stream, of varying depth, but attaining off the west coast of Ireland and Spain a depth of 800 to 900 fathoms. Secondly, of a general indraught of Antarctic water compensating at all events that part of the Gulf Stream which is deflected southwards; and thirdly, of a comparatively small quantity of Arctic water which, flowing through two or three narrow channels, replaces that portion of the Gulf Stream which makes its way into the Arctic Sea. As I have already said, the Gulf Stream loses an enormous amount of heat in its northern tour. At, say a point 200 miles west of Ushant, where the observations at the greatest depth were made on board the *Porcupine*, a section of the water of the Atlantic shows three surfaces, at which interchange of temperature is taking place. 1. The surface of the sea, that is to say, upper surface of the Gulf Stream layer, is losing heat rapidly, *a* by radiation, *b* by contact with a layer of air, which is in constant motion, and perpetually being cooled by convection; and *c* by the conversion of water into vapour. As the cooling of the Gulf Stream layer takes place principally at the surface, the temperature of the mass is kept pretty uniform by convection. 2. The band of contact of the lower surface of the Gulf Stream water with the upper surface of the water of the cold indraught. Here the interchange of temperature must be very slow, though that it does take place is shown by the slight depression of the surface isotherms over the principal paths of the indraught. The cold water being below, convection in the ordinary sense cannot occur, and interchange of temperature must depend upon conduction and diffusion, causes which in the case of masses of water of such depth must be almost secular in their action, and probably to a much greater extent upon mixture produced by local currents and by the tides. 3. The third surface is that of contact between the cold indraught and the bottom of the sea. The temperature of the surface of the earth is calculated at about 11°C., but it would be completely cooled down by anything like a movement and constant renewal of cold water; all we can say, therefore, is that contact with the bottom can never be a source of depression of temperature. As a general result, the Gulf Stream water is nearly uniform in temperature throughout the greater part of its depth; there is a marked zone of intermixture at the junction between the warm water and the cold, and the water of the cold indraught is regularly stratified by gravitation; so that in deep water the contour lines of the sea bottom are, speaking generally, lines of equal temperature. Keeping in view the enormous influence which ocean currents exercise in the distribution of climate at the present time, I think it is scarcely going too far to suppose that such currents, movement communicated to the water by constant winds, existed at all geological periods as the great means, I had almost said the sole means, of distributing heat in the ocean, and thus producing general oceanic circulation; they must have existed, in fact, wherever equatorial land interrupted the path of the drift of the trade winds. Wherever a warm current was deflected to north or south from the equatorial belt, a polar indraught crept in beneath to supply its place; and the ocean consequently consisted, as in the Atlantic and doubtless in the Pacific at the present day, of an upper warm stratum and a lower layer of cold water, becoming gradually colder with increasing depth. Wherever such conditions existed it is plain that mere vertical oscillations must have produced very decided changes of climate, through only a small number of degrees, but still very marked if the oscillation affected merely a portion of the cold underlying water, but enormous if it were sufficient to raise or depress the bottom of the sea, the principal theatre of animal life, so as to shift it from the cold layer into the warm, or from the warm layer into the cold.

One of the most striking phenomena connected with the distribution of heat in the North Atlantic is the case of the Shallow including the Hebrides, Orkney and Shetland Islands, and the Faroes, stretching westwards and northwards nearly to Iceland. The average depth is about 500 fathoms, and the Gulf Stream, which has a depth in these latitudes in summer of from 600 to 700 fathoms, occupies the whole of it, giving an abnormal temperature of something like 7° C. Owing to the peculiar conformation of the basin of the German Ocean, a tongue of cold water, with a bottom temperature of – 1° C. creeps into the valley between Scotland and Faroe, where it is overlaid by a stratum of Gulf Stream water, 150 fathoms thick. At the western mouth of the valley the cold water is banked in and retained by the water of the Gulf Stream, which is slowly passing the entrance of the gorge, giving a repetition, on a small scale, of the curious phenomenon described by Prof. Bache, off the coast of Massachusetts, as the "cold wall." My colleague, Dr. Carpenter, has conveniently called these two neighbouring districts, where the thermometer indicates 7°C. and – 1° C. respectively, the warm and cold areas. A depression, affecting that region of 250 fathoms equal to that which admitted of the accumulation of post-tertiary shells on Moel Tryfaen, would produce an extraordinary effect on its climate. In the first place, by mere subsidence, the Gulf Stream not reaching the bottom but flowing over a band of cold water, the temperature of the warm area would be reduced to, say, 3° C., and that of the cold, by an indraught of deeper water from the north, to – 2° C., but the Gulf Stream would no longer bank out the cold indraught from the north-east; which, in that case, passing down a deep open channel from the deep soundings to the west of the Loffotens, would spread along the bottom on the west coast of Scotland and Iceland, and greatly reduce its temperature, and probably entirely alter its fauna.

WYVILLE THOMSON

NOTES

WE have reason to believe that Professor Sir Wm. Thomson will be the next President of the British Association.

WE learn that the Royal Commission on Scientific Instruction and the Advancement of Science, which has met regularly two days a week, have now adjourned over the recess.

THE Royal Astronomical Society has issued a list of the members of the various learned Societies who propose to take part in the observations of the approaching total eclipse of the sun.

WE learn from the last number of the *Revue des Cours Scientifiques* which has reached us—that for the 24th inst.—that on Monday last week the Paris Academy of Sciences continued, in *comité secret*, the discussion of Mr. Darwin's nomination to fill the vacancy in the Zoological Section caused by the death of Purkinje. M. Milne-Edwards first spoke in his favour. While insisting on his own absolute opposition to evolutional doctrines, he rendered homage to the value of the special works of Mr. Darwin, especially the theory of the formation of coral islands. M. Elie de Beaumont also attested the value of this theory, and remarked that Mr. Darwin had done good work which he had spoiled by dangerous and unfounded speculations. He thought he should not be elected until he had renounced them. M. Emile Blanchard, who spoke for more than an hour, was very severe upon Mr. Darwin, styling him an "amateur intelligent," a remark capped by M. Elie de Beaumont (it is stated), who cried out, to the great indignation of M. de Quatrefages, "*C'est de la science mousseuse.*" M. de Quatrefages promised to answer M. Blanchard point by point on Monday last.

THE Archæological Congress is now in full swing at Leicester, one of the most interesting towns and localities which it is possible for such a Congress to visit. The proceedings commenced on Tuesday with an address presented by the Mayor and Corporation, followed by visits to some of the objects of interest in the town. On Wednesday the section met at the usual time, and the Abbey was subsequently visited. To-day (Thursday) there are excursions to Ashby-de-la-Zouch, Tutbury, Tamworth, and Polesworth, and a *conversazione* in the evening. The future work is as follows:—Friday—Meeting of members for business; meetings of sections; excursion to Kirby Muxloe Castle; *conversazione* in the evening. Saturday—Excursion to Groby; Bradgate Park, Ulverscroft Priory, Woodhouse Chapel, Beaumanor Park, and Grace Dieu. Monday—Meetings of sections; excursion to Melton Mowbray and Oakham; *conversazione* in the evening. Tuesday—Meetings of sections; general concluding meeting.

PROFESSOR HELMHOLTZ will take up his new duties at Berlin in April, 1871.

THE Geological Survey of India, supported by the Government, have recently issued the completing part of the sixth volume of its "Memoirs." It contains a valuable paper by Mr. W. T. Blanford on the geology of the Taptee and Lower Nerbudda valleys in Western India, illustrated by maps, plates, and numerous woodcuts. Mr. Blanford describes the geology and physical geography of the country generally, giving first an account of the results obtained by previous observers, with references to their works, followed by more precise details of later observations, thereby furnishing an exceedingly valuable monograph. The view of a dyke at Koteda, near Goojree, exhibiting the trap in curved columnar masses, is a charming little picture. Mr. A. B. Wynne gives a description of some frog-beds exposed in Bombay Island in 1867. Numerous well-preserved skeletons of Oxyglossus pusillus (*Rana pusillarius*) were found associated with ribbed fragments of plants, and large, shapeless, structureless pieces of carbonised vegetable organisms. The skeletons were found in all kinds of postures: the hind legs extended, crossed, contracted, or twisted. Dr. Ferdinand Stoliczka, the palæontologist of the survey, gives a brief sketch of the osteology of the frogs discovered, with engravings of several specimens. The same gentleman, in two new parts of the "Palæontologia Indica," just issued, has given engravings and descriptions of some of the Gasteropoda of the Cretaceous rocks of southern India. This work, published at the expense of the Indian Government, is intended to comprise figures and descriptions of the organic remains found during the progress of the survey. The new parts complete the second volume of the Cretaceous fauna of India, with useful tables and an index of species. Mr. Thomas Oldham, the indefatigable superintendent of the survey, has commenced the publication of "Records" of the proceedings of the officers in various parts of India, of which the first four numbers are before us, containing much interesting geological information.

DEATH is hard on the medical profession just now. James Copland, M.D., F.R.S., died on the 17th inst., at the age of seventy-eight. From an obituary notice in the *British Medical Journal*, we learn that his principal claim to fame rests mainly on his performance of that gigantic work "The Medical Dictionary"—which he undertook, and carried to completion after a labour of thirty years. On finishing this work, he wrote in the preface that his labours, which had been incessant for many years, had been persisted in under circumstances and contingencies which few could have endured. Every line in it was written by his own hand, and all the proofs were carefully read and corrected by himself. The Dictionary is a cyclopædic *résumé* of all that has been written on the various subjects treated in it, from the earliest days of medicine down to modern times, with copious references to all the sources of information; and with all this are given the opinions which the author's observation and experience had led him to form. That one man should have undertaken and, labouring single-handed or nearly so, completed such a work, is indeed a remarkable fact. The work is a monument of calm energy and self-reliance, such as is but rarely met with.

NATURAL phenomena must be regarded by the engineer in the tropics. Here the boring worm will teach him salutary caution. In the East we have seen a railway train stopped on an incline by locusts. The locusts have a fancy for sitting on the rails, and when the engine-wheel touches them they are crushed, leaving the rails so oily that the engine slips. On one line, in the locust season, sand-boxes are used with the locomotive. Oysters are, however, a newly recorded enemy to the engineer. Some gourmand suggested the harbour of Tuticorin as a suitable place for oyster beds, and the Madras Government, doubtless appreciative of the value of oysters either for eating or for pearls, turned a deaf ear to remonstrance. Time has, however, justified the remonstrants, for, though the projectors have got an abundant supply of oysters, the harbour of Tuticorin is now said to be in danger of total destruction by the growth of the oyster beds, and the attention of the Government is seriously directed to cross the love of the oysters. The Madras coast is so ill-provided that harbours are more valuable than oysters, and a campaign will be directed against the latter, although the revenue authorities hanker after the taxes on the pearl fishery.

AN experiment, performed by M. J. M. Philipeaux, in which he transplanted one of the incisor teeth of a guinea-pig into the comb of a cock, has been referred to by M. P. Bert in his "Thesis on Animal Grafting," but M. Philipeaux thought that the examination of the specimen with an account of the experiment would be interesting to the members of the Society of Biology, and he accordingly submitted it to their inspection, with the following observations:—On January 13, 1853, M. Philipeaux, after having made an incision into the head of a young cock, introduced into it the incisor tooth of a guinea-pig that had been born a few hours previously. The tooth, very complete and furnished with its bulb, was so placed that the bulb was at the bottom of the wound and the extremity of the tooth turned outwards. On the day the experiment was made the tooth was eight millimetres long and two millimetres thick. The cock was killed ten months after the operation. The tooth, which, on the day of operation, was entirely concealed and covered in the wound, projected, when the animal was killed, five millimetres from the surface. M. Philipeaux had dissected out in the specimen the whole length of the tooth, and found that it measured no less than thirteen millimetres; it had consequently grown five millimetres. The interest of this experiment, which in other respects resembles those of Hunter and Sir A. Cooper, in which the spur of the cock was transplanted to the comb, consists in the circumstance that here a graft was accomplished in one animal of a part belonging to another, belonging to an entirely different zoological class.

WE are sorry to announce the death of Von Graefe, the most distinguished oculist in Europe. Iridectomy, the contribution to ophthalmic surgery with which his name is chiefly associated, was but one out of a multitude of operations which made his clinique at Berlin the resort of persons labouring under eye-diseases from all parts of the world.

WE have received from the Government of Victoria a most valuable collection of the Mineral Statistics of that Colony. Among the appendices is an important illustrated paper by Mr. Ulrich, F.G.S., entitled "Contributions to the Mineralogy of Victoria." We shall return, if space permits, to this interesting State paper. In the meantime, we may state that the total value of the gold raised in the Colony to the end of last year has been 152,706,120*l.*, and that diamonds, rubies, sapphires, topaz, &c., are now being found.

WE learn from the *British Medical Journal* that M. Duruy (late Minister of Public Instruction), M. Nélaton (the great surgical celebrity of Paris), M. Husson (commonly called Sa Majesté l'Assistance Publique), and M. Milne-Edwards (the well-known semi-English Frenchman and philosopher), are at the head of a movement to found an *Ecole de Médecine* specially for women. The programme has been submitted to the Empress, accompanied by a request that she should become patron of the projected school. In France it is argued that there really is scope for something of this kind. It is alleged that the practice of medicine, from the present dull level of all being competent practitioners, is in a bad state; that it is necessary to institute a new body of practitioners, competent for drudgery and ordinary emergencies, but not competent for consulting practice. It is said that the mass of the profession are far too well educated, and that it is only by having a dash of the charlatan that even a good man can rise above the ranks. This surely is throwing a new light on the question.

THE Abbé Moigno announces in the last number of *Les Mondes* that the stone knives with which Joshua performed the rite of circumcision have been found in his tomb by the Abbé Richard. The account, which concludes as follows, we commend to the special attention of Mr. John Evans and Mr. Sorby:—"Voici donc qu'un des faits historiques les plus singuliers de la Bible a reçu la confirmation la plus éclatante, et que nous entrons en possession de silex taillés il y a 3,550 ans, plus vieux bien certainement, nous le prouverons jusqu'à l'évidence, (!) que les silex taillés de la vallée de la Somme ou des grottes d'Aurignac. Qui sait même si le spectroscope manié par des mains aussi habiles que celles de M. Sorby ne nous démontrera pas la présence, sur quelques-uns de ces silex, du sang de la circoncision." (!!)

OUR readers will recollect the important part played by the telegraph in the Seven Days' War, the introduction of this new arm, so to speak, enabling von Moltke to control all the strategical combinations with unerring accuracy, from a small room in Berlin. To the telegraph the Prussians have now added the balloon, and already we hear that the French army encamped in the environs of Metz have been surveyed with the greatest care. Surely if strategy is to play the part it did in former times in future battles, given two armies, one of which is, by means of a balloon, in electric communication with the Head-quarter Staff, in perfect knowledge of the numbers, at any one point, and the movements of the other, its success must be assured.

PERSONS wanting chemical and philosophical materials and apparatus from Germany, already experience a delay from the interrupted communications even in this beginning of hostilities.

THE heat has been so great at Dowlashéram, in the Madras Presidency, in June, that the Indian papers report many birds have died of sun-stroke.

AMONG the scientific labours of the Government in India in the departments of agriculture and horticulture, which have given such good results in tea and cinchona, may be recorded a garden at Raneekhet, the new hill station above Simla, for supplying vegetables to the troops, and an experimental cotton garden in the Boolundshur district. One chief object of the latter is to test the application of irrigation to various descriptions of cotton seed. Some appear to require water, and some to be injured, but there is no scientific record.

IN the progress of public opinion the public of Madras have come to the conclusion that the monkeys of that city, formerly held sacred, are a nuisance, and the municipality has taken measures to deport them. This requires—first, that they shall be caught. When caught they are to be tenderly treated; but for fear of their early return the aid of modern science is to be called in, and they are to be conveyed by railway trains to Tiruputty. In the distribution of animals the naturalist has thought fit to make little account of the railway, which may effect a displacement of the monkeys of India.

THE necessary operations for the construction of the sea-wall of the New Brighton Aquarium are progressing, It is expected that the aquarium will be completed and furnished by the spring of next year.

"SPONTANEOUS Generation and the Hypothesis of Physiological Units," by Herbert Spencer, is a reprint of a paper intended for the *North American Review*, in reply to an article that appeared in that journal entitled "Philosophical Biology," in which Mr. Spencer thinks that his views on the origin of life are not correctly represented.

THE *Scotsman* describes a Mirage in the Firth of Forth, the most extraordinary instance which can be remembered, which occurred on Friday afternoon. The day was very hot and sultry, and there was a peculiarity about the atmosphere which is seldom observed in this country. About midday a thin, clear, and transparent kind of vapour, through which the surrounding objects began to make their appearance in the most fantastic and grotesque shapes imaginable, settled over the sea. The phantasmagoria were principally confined to the mouth of the firth; but at one time they embraced the whole of the Fife coast as far as the eye could reach, town, village, and hamlet being depicted high up on the horizon with remarkable distinctness. Though the whole coast seemed at least half-way up the horizon, the appearances presented by the towns were very different, some of them having the houses inverted, while others appeared in the natural position. The Bass Rock, the Isle of May, and the rocks around Dunbar harbour, however, attracted most attention, both from their proximity and from the extraordinary forms which they assumed. The Bass, which at one time seemed to lie flat upon the sea, suddenly shot up into a tall spiral column, apparently ten times its usual height, surrounded by battlements rising tier on tier, and presenting a most imposing spectacle. As usual, however, the most fantastic appearances were presented by the May, which, in the course of the afternoon, underwent an almost innumerable series of phantasmagoric transformations. At one time it was apparently as round as a circle, at another seemingly draw out for miles against the horizon; now flat upon the water, then rising to ten times its usual height; occasionally portions appeared to break off and sail away, then to return and unite again—all within the space of a few minutes. Vessels in the offing appeared double—one on the water, and another inverted in the air; and in one instance three figures of one vessel were distinctly visible—one inverted, another on the sea, and a third in its natural position between the two. The fishing boats proceeding to sea in the evening underwent the same transformations when only a few yards off the shore, the double appearance being distinctly visible within a certain distance. The rocks at the harbour also seemed to play fantastic tricks, opening and shutting, rising and falling, with apparent regularity. These extraordinary illusions lasted from midday till night-fall, and excited great interest among the inhabitants of Dunbar, numbers of whom collected in the Castle Park and at the harbour for the purpose of witnessing the phenomena.

WE have received from M. J. L. Soubeiran an interesting account which he has communicated to the Société Impériale d'Acclimatation, of the progress of pisciculture in the Neilgherries, based on Mr. Day's paper in the Proceedings of the Zoological Society.